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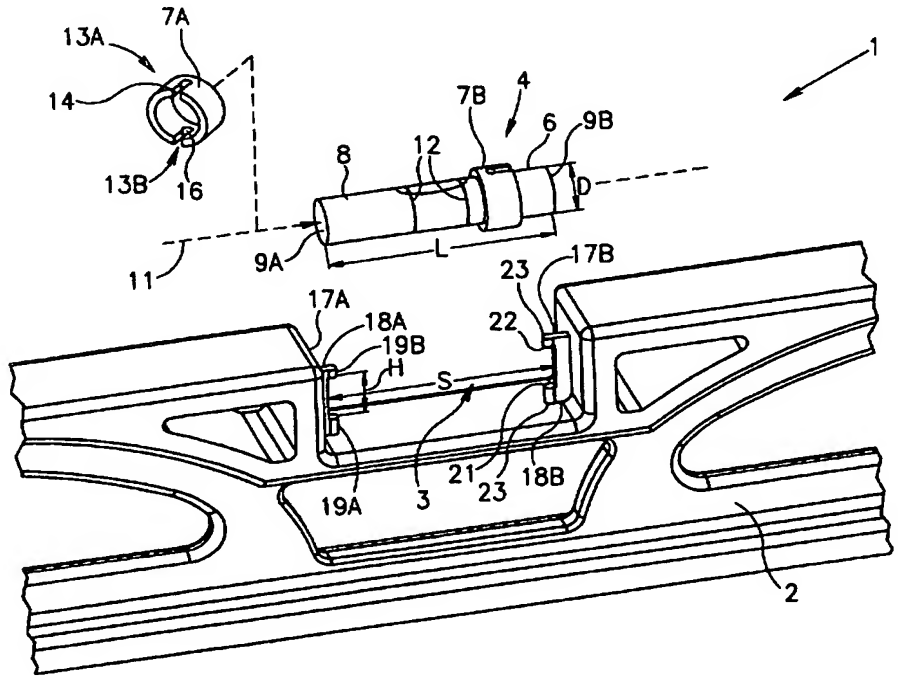
(54) Title: RETAINER CLIPS FOR SECURING A CYLINDRICAL LEVEL VIAL



(57) Abstract: Hand tool (1) including a pair of retainer clips (7A,7B) for securing a cylindrical level vial (6) in a recess (3), and method of assembly therefor.

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RETAINER CLIPS FOR SECURING A CYLINDRICAL LEVEL VIAL

Field of the Invention

The invention is in the field of hand tools with spirit level functionality in general, and hand tools with one or more cylindrical level vials providing their spirit level functionality in particular.

Background of the Invention

Hand tools with spirit level functionality typically include either low end cylindrical level vials with reading lines on their exterior surfaces or high end machined acrylic blocks with barrel shaped level vials having reading lines on their interior surfaces. Cylindrical level vials are typically of the injected molded acrylic type which have now largely superseded the conventional glass blown type. Cylindrical level vials are typically secured in hand tools by way of either one of two conventional assembly techniques as follows: First, a snap-fit arrangement as illustrated and described in US Patent 4,571,845 to J. Wright, et al entitled *"Polycast Level Instruments with Means for Retaining Level Vials Therein"*. And second, by gluing.

Summary of the Invention

The present invention is for a hand tool having a pair of retainer clips for securing a cylindrical level vial in a suitable recess prepared in its web. The recess preferably snugly accommodates a cylindrical level vial both lengthwise and diameterwise, thereby ensuring correct orientation of the level vial with respect to the hand tool. The present invention is particularly suitable for a wide range of plastic molded or metal casted hand tools whose web thickness can be readily controlled during manufacturing. The main purpose of the hand tools

may not necessarily be for use as a spirit level but are additionally provided with spirit level functionality for user convenience.

Brief Description of the Drawings

In order to understand the invention and to see how it can be carried out in practice, preferred embodiments will now be described, by way of non-limiting examples only, with reference to the accompanying drawings in which similar parts are likewise numbered, and in which:

Fig. 1 is a perspective close-up view of a portion of a spirit level and a partially dissembled level vial assembly for use therewith in accordance with the present invention;

Fig. 2 is a perspective close-up view of the portion of the spirit level of Figure 1 with the assembled level vial assembly mounted therein; and

Fig. 3 is a close-up view of an alternative cylindrical level vial retaining arrangement in accordance with the present invention.

Description of Preferred Embodiments

Figure 1 is a close-up view of a portion of a plastic molded spirit level 1 (constituting a hand tool with spirit level capability) including a web 2 formed with a recess 3 for receiving a level vial assembly 4 for horizontal leveling purposes. The level vial assembly 4 includes a cylindrical level vial 6 and a pair of annular retainer clips 7A and 7B for securely mounted the level vial 6 in the recess 3. The level vial 6 has a cylindrical exterior surface 8, a pair of opposite end walls 9A and 9B, and a longitudinal axis 11. The level vial 6 has a length L and a diameter D. The exterior surface 8 is provided with a pair of reading lines 12 for providing a visual indication as to whether the level vial 6 is horizontally aligned along its longitudinal axis 11. Each retainer clip 7 is slidable along the level vial 6, and has a pair of identical notches 13A and 13B each having a narrow neck 14 widening into a horseshoe shaped recess 16.

The recess 3 has a pair of opposite side walls 17A and 17B respectively provided with vial supports 18A and 18B each formed with identical lower and upper lugs 19A and 19B respectively having an upper surface 21 and a lower surface 22. The separation S between a recess's opposite vial supports 18A and 18B is only slightly greater than the level vial's length L whereby a level vial 6 is snugly lengthwise accommodated therebetween. The height H between the lower lugs' upper surfaces 21 and the upper lugs' lower surfaces 22 is only slightly greater than a level vial's diameter D whereby a level vial 6 is snugly diameterwise accommodated therebetween. The lower lugs 19A and upper lugs 19B are formed with widened tips 23 for a snap-fit arrangement in a retainer clip's recesses 16.

The method of assembly of the spirit level 1 is as follows:

The two retainer clips 7A and 7B are slided toward the middle of the level vial 6. The assembled level vial assembly 4 is inserted into the recess 3 from the side so as to be snugly accommodated therein both lengthwise and diameterwise. The retainer clips 7A and 7B are displaced away one from the other until the retainer clip 7A snap fits onto the vial support 18A and the retainer clip 7B snap fits onto the vial support 18B (see Figure 2).

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications, and other applications of the invention can be made within the scope of the appended claims. For example, an Ω shaped retainer clip 24 can be employed for sliding insertion into a pair of cutouts 26A and 26B formed on either side of a semi-cylindrical vial support 27 (see Figure 3).

Claims:

1. A hand tool with spirit level functionality comprising:

(a) a cylindrical level vial having a longitudinal axis;

(b) a web having a recess with a pair of opposite side walls for snugly lengthwise receiving said level vial; and

(c) a pair of retainer clips for securely mounting said level vial in said recess.

2. The tool according to claim 1 wherein a retainer clip of said pair of retainer clips is annular shaped for slidingly receiving said level vial.

3. The tool according to claim 2 wherein a retainer clip has a notch for securely engaging a lug protruding from a side wall of said recess in the axial direction of said level vial in said recess.

4. The tool according to claim 3 wherein said lug prevents the outward displacement of said level vial from said recess in a direction perpendicular to its longitudinal axis in the plane of said web.

5. The tool according to claim 2 wherein a retainer clip has a pair of notches for securely engaging a pair of lugs protruding from a side wall of said recess in the axial direction of said level vial in said recess.

6. The tool according to claim 5 wherein said pair of lugs snugly receive said level vial diameterwise to prevent the outward displacement of said level vial from said recess in a direction perpendicular to its longitudinal axis in the plane of said web.

7. A hand tool with spirit level functionality substantially as described hereinabove and as shown in the attached drawings

8. A method for assembling a hand tool with spirit level functionality, the method comprising the steps of:

(a) providing a hand tool with a web having a recess with a pair of opposite side walls for snugly lengthwise receiving a cylindrical level vial having a longitudinal axis;

(b) placing an injected molded near cylindrical level vial in the recess; and

(c) deploying a pair of retainer clips for securely engaging the level vial in the recess.

9. The method according to claim 8 wherein the level vial is initially provided with a pair of annular retainer clips slidingly mounted thereon whereby the pair of retainer clips are outwardly displaced one away from the other for securely engaging the opposite side walls of the recess.

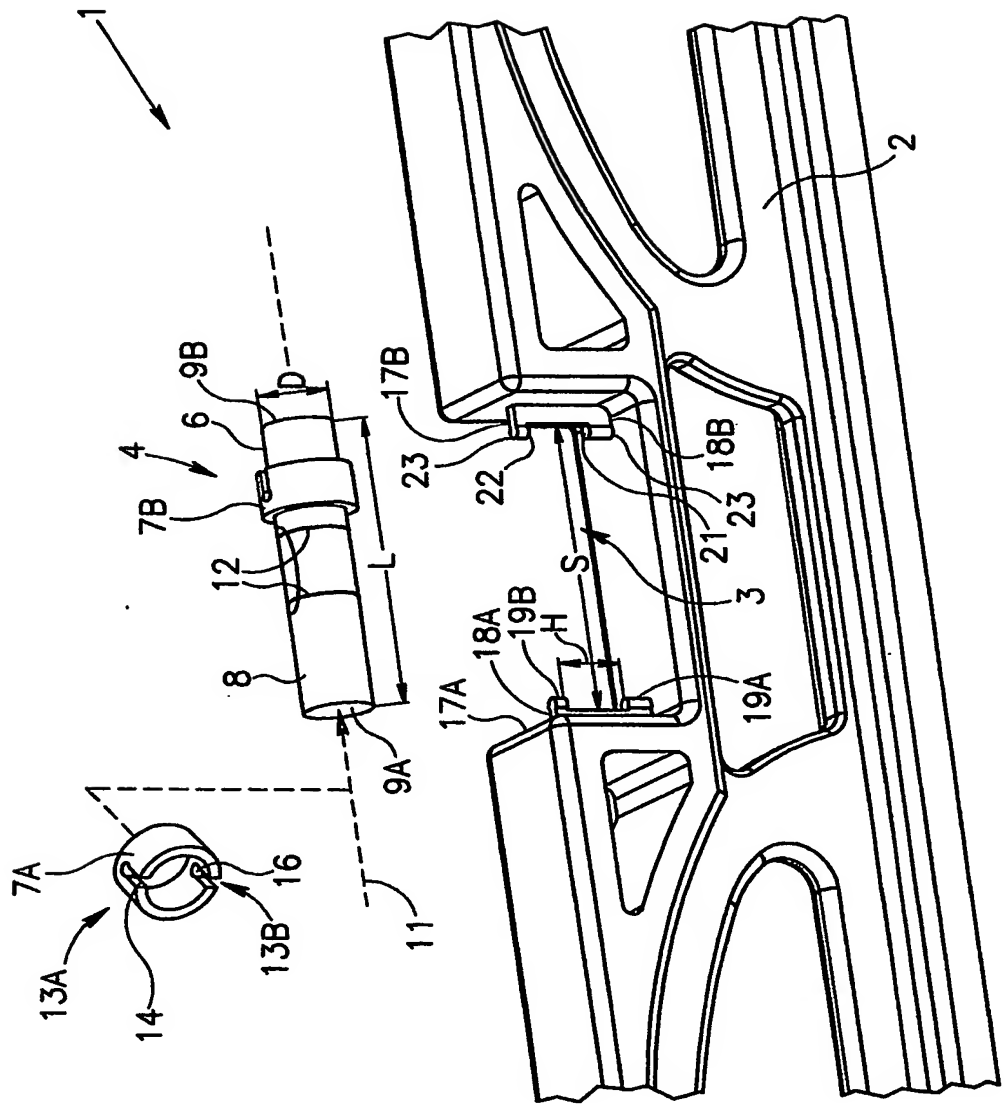
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FIG.1

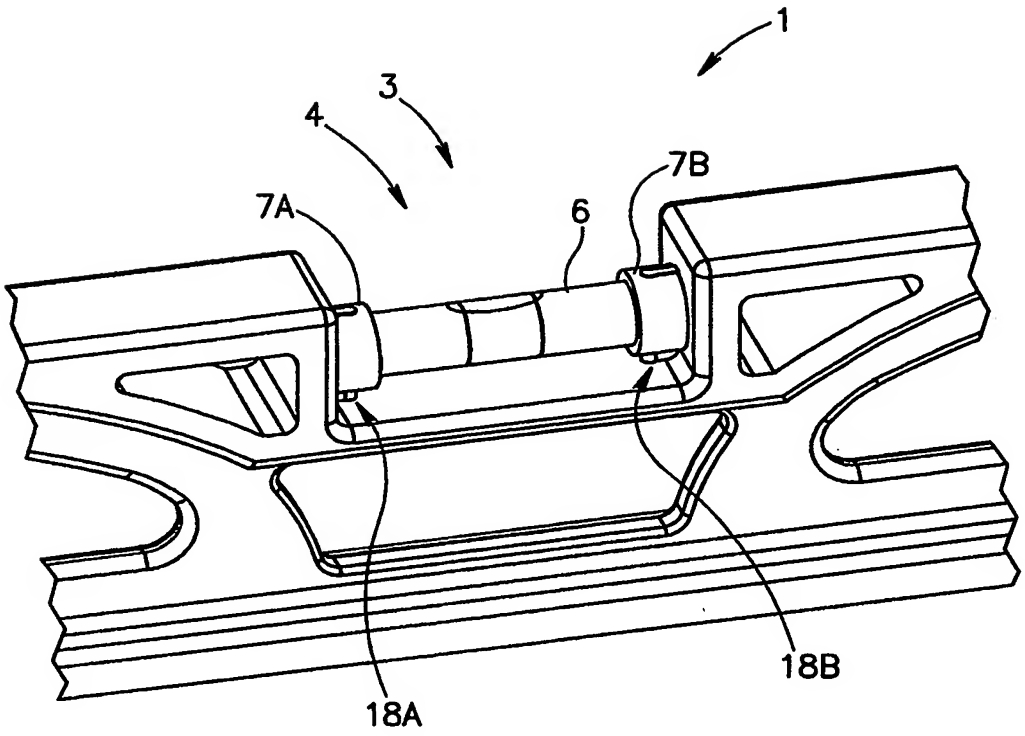

FIG.2

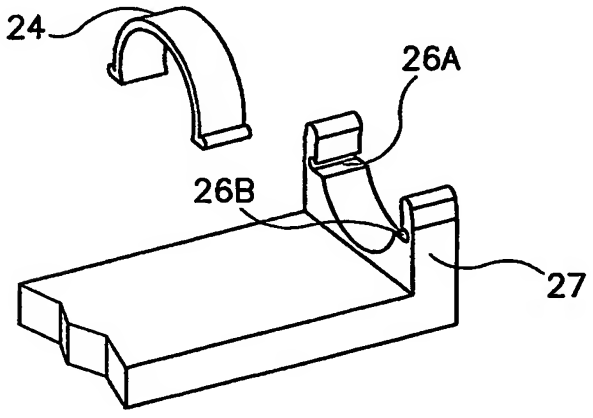

FIG.3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01C25/00 G01C9/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 456 354 A (WRIGHT DONALD E) 22 July 1969 (1969-07-22) column 3, line 65 -column 4, line 57; figures	1-9
X	US 3 871 110 A (GUTOWSKI ANTONI PAWEL ET AL) 18 March 1975 (1975-03-18) column 2, line 1 - line 63; figures	1-9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3456354 A	22-07-1969	NONE	
US 3871110 A	18-03-1975	DE 2445582 A1	12-06-1975
		FR 2254010 A1	04-07-1975
		JP 1137486 C	28-02-1983
		JP 50092762 A	24-07-1975
		JP 57028083 B	15-06-1982